Safety Villages: a computer game for raising children's awareness of risks

Mario Rafael Ruíz Vargas
Computer Science Department,
Universidad Carlos III de Madrid, Spain
mrrvarga@inf.uc3m.es

Telmo Zarraonandia
Computer Science Department,
Universidad Carlos III de Madrid, Spain
tzarraon@inf.uc3m.es

Paloma Díaz
Computer Science Department,
Universidad Carlos III de Madrid, Spain
pdp@inf.uc3m.es

Ignacio Aedo
Computer Science Department,
Universidad Carlos III de Madrid, Spain
aedo@ia.uc3m.es

ABSTRACT

Computer games have proved to be a valuable educational resource in many different areas from medicine to military training as well as specific training in emergency responses. Their motivational benefits also make them particularly suitable for training children. However, in order to enjoy the benefits that the use of computer games may report, it is necessary that the games resemble those which children play for fun, and that it offers an appropriate balance between its educational and entertainment purposes. In this paper we present an educational game called "Safety Villages" of the mini-game genre which aims to help raise children´s awareness of emergencies and domestic risks. The design and implementation of the game has been carried out following strategies and integrating components usually present in games for entertainment. A preliminary evaluation of the game has shown a positive response in children, indicating that they can both learn and enjoy themselves while playing the game.

Keywords

Educational Computer Game, Emergency Education for Children, Computer Supported Education, Emergency Training, Interactive Systems, Edutainment

INTRODUCTION

Computer games have been sucessfully used for training and education in diverse areas such as medicine, military, science, etc (Macedonia, 2002; Remision, 2012; UN/ISDR, 2012). Because of their efficacy when improving the motivation and interest of the student (Druckman, 1995) computer games constitute a valuable educational resource for the trainings conducted under a "non-formal learning" modality. This is the case in the education of children in emergency response procedures, which despite its importance is seldom included as part of the standard curricular learning activities at school.

Unfortunately, the design of a successful educational computer game (EG) is a challenging task. On the one hand, it is often the case that educational games reveal their educational purpose too soon. Crosswords and puzzles in general are very popular on web sites dedicated to educating children about emergencies, but irrespective of the carefully prepared graphics or videos which they are often accompanied by, these kinds of games fall short of the ones that children habitually play for fun. In order to encourage the use of a game it is advisable that it resembles one of those which children play when not learning. For the designer, this not only means paying close attention to the aesthetic aspects of the game but also including mechanisms present in popular games such as rewarding, personalisation, sharing, communication, etc. In addition, EG designers not only have to tackle the technical complexity inherent in game design, but also have to interleave the learning activities that support the attainment of the learning objectives in a subtle way. Therefore, it is necessary to carefully balance the educational and entertainment purposes of the game. As Fabricatore states in (Fabricatore, 2000), focusing only on the motivational aspects of the game might lead to EG which lack cohesion between the cognitive tasks and game-play. In order to fully exploit the educational value of games, the same author proposes designing games in which the learning tasks are contextual to the game in the sense that they are perceived as a true element of the game-play and not simply an "add-on".

Proceedings of the 9th International ISCRAM Conference – Vancouver, Canada, April 2012
L. Rothkrantz, J. Ristvej and Z. Franco, eds.

1

Following these ideas we have designed and implemented an EG of the mini-game genre called "Safety Village", which aims to help raise children´s awareness of emergencies and domestic risks. In the next section we describe some game mechanisms and components often present in many commercial games which have been considered when carrying out the design and implementation of the "Safety Village" game, and an examples of EG used in emergency training for kids which exhibit the desired characteristics. After that, we describe the main features of the proposed game and of each of the different mini-games which contains. The design of these mini-games has been conducted and supported by the EG model presented in (Zarraonandia, Díaz, Aedo and Ruíz, 2011). Following, we describe the results of a preliminary evaluation carried out with the aim of evaluating the success of the game and detecting any possible problems when children play it. Finally some conclusions and future lines of work are presented.

RELATED WORK

The potentiality of computer games for training children in emergency response has not gone unnoticed by many educators. In response many government agency websites (FEMA, 2012; Spanish Civil Protection, 2012; Italian Civil Protection, 2012; US Fire 2012,) provide educational games which address the special requirements of children and help to prepare them to react to different types and levels of emergency. However, many of these games are very simple or constitute a direct translation of the games used for training kids without computers, such as, coloring pages, crosswords or matching games. These games are far removed from the games children play for fun, whose complexity has grown exponentially over the last few decades. Nowadays games exhibit a high degree of sophistication not only in terms of graphical resources and advanced interaction mechanisms but also with regard to their narratives and rules. For instance, many games now use the concept of "missions" that the player should accomplish. Another concept, which is currently very popular, is the "mini-game", a game of little complexity which provides one single type of challenge and that can be completed in a small amount of time (Prensky, 2005). The social component of the game has also gained increasing importance, and most current games offer some sort of multiplayer mode in which the player can compete or collaborate with other players. In order to facilitate the identification of the player with his/her avatar many games include the opportunity to customize it or personalize it to some extent. Finally, the advent and increasing popularity of new interaction devices such as touch screens, the Wiimote or Microsoft's Kinetic are changing the traditional way in which players interacted with the games, offering new and exciting possibilities.

It is clear that the application of all these techniques and strategies in popular commercial games would considerably increase the cost associated to the design and development of the EG. This is probably the main reason why there are so few examples of EG which make use of them in this area. One of those examples is the Stop Disaster! (UN/ISDR, 2012), a game developed by the International Strategy for Disaster Reduction with the aim of teaching 9-16 year old children important facts about tsunamis, wild fires, floods, hurricanes and earthquakes. The game greatly resembles the casual games of the simulation genre, offering the player the opportunity to design a preparation strategy for a little village, taking appropriate steps and making suitable arrangements to mitigate the effects that each type of disaster would have on it.

THE SAFETY VILLAGES GAME

"Safety Villages" (left hand side Fig 1) is an EG of the mini-game genre whose aim is to help children learn to identify and solve causes of domestic accidents, and to identify evacuation route signals. In the game players move their avatars around a series of interconnected villages, each of which contains a series of mini-games for training on a different subject or skill related to those learning objectives.

Currently there are three different villages available: "Risky Village", "Solving Risks Village" and "Emergency Route Village". The objective of the "Risky Village" game is to help children identify objects and situations that could be the origin of an accident, as for instance, an electric appliance on the floor of the bathroom. For this to be achieved, the players will move their characters around a village in which they will find, among other elements, different buildings representing houses and schools. Each time a player enters one of them he/she will have the opportunity to play a game which consist of moving his/her character around the rooms in the building, looking for and identifying objects which could be the origin of an accident (left hand side Fig 2). The difficulty level of the game depends on which village the house or school the children have chosen to enter, as each of them has a different configuration of rooms, a different amount of risks to be identified, and may also include restrictions on the time available to complete the game or the number of risk identification failures.

Once children have learned to identify risks, they gain access to the "Solving Risks Village" game, whose objective is to help children learn to take the most appropriate course of action for each type of risk. This way, the mechanics of the game are very similar to the previous game but now each time the child identifies one risk

Proceedings of the 9ᵗʰ International ISCRAM Conference – Vancouver, Canada, April 2012
L. Rothkrantz, J. Ristvej and Z. Franco, eds.

2

he/she also has to choose the correct action to take among a set of possibilities (right hand side Fig 2). Once again the difficulty of the game varies, depending on the house or school of the village chosen.

Finally, the aim of the games in the "Emergency Route Village" (right hand side Fig 1) is to help children learn that in the case of an emergency situation, they have to follow the recommended evacuation route and look for an adult. Once again the games start when the children manage to get their character into one of the houses or schools in the village but, in this case, the objective is to find the exit of the building. To achieve this objective children have to learn to identify and to interpret the signals and the evacuation plans depicted on some of the walls in the rooms. They should also learn that when they find any adult, they should follow their advice. Left hand side of Fig 3 depicts a screenshot of the game. Again, the difficulty of the game varies for each of the houses and schools in the village, presenting different extensions of the map of the building, the possibility to consult it or not, time restrictions, etc.

All the games can be played both in stand-alone as well as in multiplayer modality. When a player wants to play a game in the latter modality he/she just waits for other players to get inside a building and activate the start of the game together by choosing a competition or collaboration mode. In the competition mode, and depending on the village the building belongs to, the winner of the game will be the child who identify more risk, solve them correctly or find the exit to the school in the first place. In the collaboration mode there is no winner as all the children share and contributes to the same score, trying altogether to identify the all risks, solve them and find the exit in the least amount of time as possible.

The game also implements some popular mechanisms often found in commercial games. For instance, during the game children count with the help of a character which represents a policeman, and who will provide them with advice on what to do, as well as educational feedback on their actions. For instance, the policeman can detect whenever the child is far away from the evacuation route and help him/her to find the right path, and/or can inform the child about the emergency that the risk he/she has just identified may imply. Children can also design and personalize their own avatars choosing different parts of the body, clothes, and complements (right hand side Fig 3). In addition, a series of treasure boxes spread along the villages allow the players to access and browse the rankings of the games. Finally, children can communicate during the game by sending messages to each other.

The "Safety Villages" game have been implemented using OpenSpace (OpenSpace, 2012), an editor which allows the creation of Flash isometric virtual worlds which can later on be released through SmartFox Server engines and accessed using a web navigator, without requiring the installation of additional software.

Figure 1. Screenshots of the "Safety Villages" main village (left) and the "Emergency Route Village" (right)
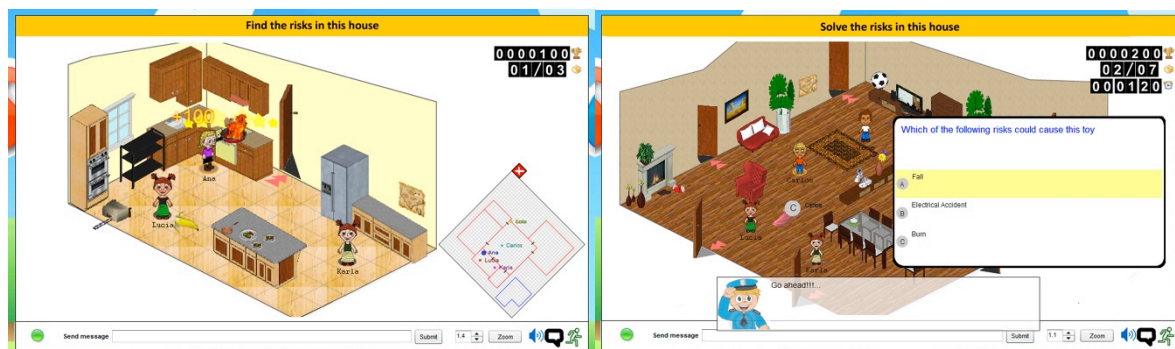

Figure 2. Screenshots of the "Find Risks" (left) and "Solve Risks" (right) games

Proceedings of the 9th International ISCRAM Conference – Vancouver, Canada, April 2012
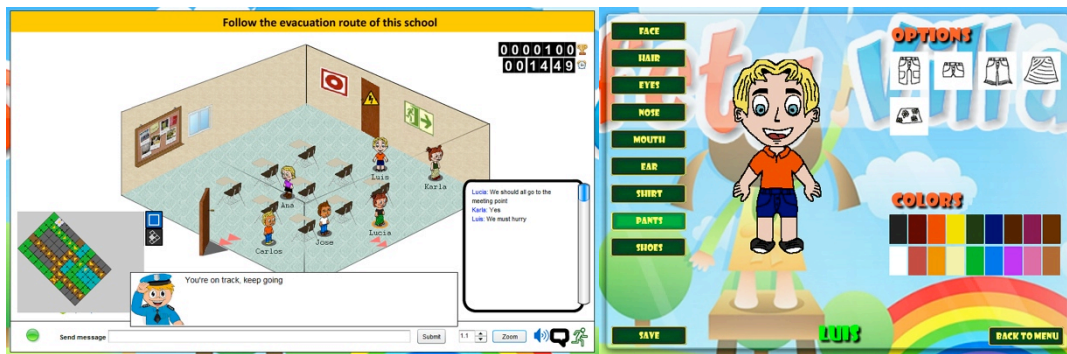*L. Rothkrantz, J. Ristvej and Z. Franco, eds.*

3

Figure 3. Screenshots of the "Evacuation route" game (left) and of the avatar creation assistant (right)

Figure 4. Preliminary evaluation

PRELIMINARY EVALUATION

A preliminary evaluation of the videogame has been conducted with the aim of assessing if the game accomplishes both the educational as well as the entertainment goal. The participants of the evaluation were 5 children whose ages ranged from 8 to 11 years old, each of whom was provided with a laptop to connect to the game server and play the game. The experience was supervised by an educator who provided assistance to the children when required. The participants were organized in two groups each of which played the game simultaneously. Fig 4 depicts a picture taken during the experience.

The duration of the game session was approximately 30 minutes, and afterwards participants were asked to fill in a questionnaire specifically adapted for this type of user. The questionnaire was divided into two sections: the first evaluated the success attained on the entertainment goal, and the second one the success on the educational purpose. Following these objectives, the first section included three questions: "How much did you enjoy playing the videogame?", "Would you like to play the videogame again?", and "How easy was it to play the videogame?". Children rated their answers on a Likert scale of 5 points, which ranged from "Very Much" to "Nothing at all", by ticking on pictures of faces, whose expressions depicted the degree of satisfaction corresponding to their own. To the first two questions all the children answered "Very Much" except one who answered "Much". With regard to the third question, the youngest child rated the difficulty of the game as "Regular" while the rest of children choose "Very Much (easy)". The second assessment included a battery of questions to test the knowledge acquired by the child about the risks and emergencies represented in the game. This way, children should choose from a set of possible situations the one which may cause a fire, to specify which type of risk an electric appliance in the bathroom may provoke, which is the appropriate action to take in the case of finding a liquid spilt on the floor or which signal depicts an evacuation route. All children answered correctly to all the questions in this section. The absence of wrong answers seems to indicate that the children attained the learning objectives of the experience, and that the educational purpose of the game is therefore accomplished. However, in order to verify that this is the case, it will be necessary to carry out a thorough evaluation in which the previous knowledge of the children on the subject is assessed beforehand.

CONCLUSIONS AND FUTURE WORK LINES

The results gathered by the preliminary evaluation have been encouraging. Children showed a very positive response to the game, and they enjoyed designing the avatars, playing the game together and sending messages to each other. The answers to the second question in the questionnaire would also seem to indicate that they truly learn while having fun and that the educational goal is therefore in balance with the entertainment purpose of the game. The youngest children experienced a little more difficulty playing the game than the older ones, and needed a bit more assistance from the educator. In the next version of the game we will try to respond to this issue by making use of a player profile which will include, among other information, his/her age and the number of times he/she has played the game. Based on that information the game will automatically graduate the number and type of assistance messages provided by the policeman character.

As the preliminary evaluation has not raised any major problems in the game design, the next step in our work is to corroborate the positive results through a more exhaustive evaluation which will include a higher number of participants. This evaluation is scheduled to take place in the winter of 2012 in collaboration with approximately 20 participants from a primary school in Madrid, and 5 educators. Future lines of work will also include the design of new mini-games for teaching children how to respond to emergencies in other scenarios, such as in the countryside, and new villages for training children on some specific types of natural disasters.

ACKNOWLEDGMENTS

REFERENCES

1. Druckman, D. (1995) The educational effectiveness of interactive games, In D. Crookall & K. Arai (Eds.), *Simulation and gaming across disciplines and cultures: ISAGA at a watershed* (pp. 178-187). Thousand Oaks, CA: Sage. 1995

2. Fabricatore, C (2000) Learning and videogames: An unexploited synergy, In: 2000 AECT National Convention, Long Beach

3. Federal Emergency Management Agency (2012) [Online] Available: http://www.fema.gov/kids/, [Accessed: Jan. 13, 2012]

4. Italian Civil Protection (2012) [Online] Available: http://www.protezionecivile.it/sitobambini/home.html, [Accessed: Jan. 13, 2012]

5. Macedonia, M. (2002) Games soldiers play, IEEE Spectrum. 30(3):32–37

6. OpenSpace (2012) [Online] Available: http://www.openspace-engine.com [Accessed: Jan. 13, 2012]

7. Prensky, M. (2005). In educational games, complexity matters. Mini-games are trivial – but ''complex'' games are not. An important way for teachers, parents and others to look at educational computer and video games. *Educational Technology*, Vol. 45 No.4 July-Aug

8. Remission (2012) [Online] Available http://www.re-mission.net/ [Accessed: Jan. 13, 2012]

9. Spanish Civil Protection (2012) [Online] Available: http://www.proteccioncivil.org/webinfantil/ [Accessed: Jan. 13, 2012]

10. UN/ISDR (2012), Stop Disasters! [Online] Available http://www.stopdisastersgame.org/en/playgame.html. [Accessed: Jan. 13, 2012]

11. U.S. Fire Administration for Kids (2012) [Online] Available: http://www.usfa.dhs.gov/kids/flash.shtm, [Accessed: Jan. 13, 2012]

12. Zarraonandia, T., Díaz, P. Aedo, I and Ruíz, M. R. (2011): Seeking Reusability of Computer Games Designs for Informal Learning, in Proceedings of the 2011 11th IEEE International Conference on Advanced Learning Technologies (ICALT)

Proceedings of the 9th International ISCRAM Conference – Vancouver, Canada, April 2012
L. Rothkrantz, J. Ristvej and Z. Franco, eds.

5